

VEHICLE STEERING HEAD

CROSS-REFERENCE TO RELATED APPLICATIONS

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BACKGROUND OF THE INVENTION

1. Field of the Invention

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2. Discussion of Background Information

Vehicle steering heads of the above-described type are in particular used in bicycles or tricycles, and in particular in tricycles or bicycles for children.

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towards uncontrolled steering movements of the front wheel which cannot be mastered or effectively controlled by small children, in particular.

SUMMARY OF THE INVENTION

5 The present invention therefore provides a vehicle steering head of the above-mentioned type which is of a simple construction and which can operate in an easy and reliable manner. Moreover, this design avoids the drawbacks of the prior art and can in particular limit a handlebar deflection to a desired degree. The invention also has provision for locking the handlebar.

10 According to one aspect of the invention a latch element is secured to a fork tube on a portion provided inside the support tube. A linkage element is supported in the support tube for rotation therewith. The linkage element is displaceable or moveable in a longitudinal direction of the support tube. The linkage element comprises at least one stop surface which limits a rotation of the fork tube and can be brought into contact with the latch element. Moreover, the linkage element comprises at least one locking element which is releasably connectable to the latch element.

15 According to another aspect of the invention a latch element is supported on the support tube. A linkage element is arranged on the fork tube and connected to the tube for rotation therewith. The latch element is freely displaceable or moveable along the support tube. The linkage element comprises at least one stop surface which limits a rotation of the fork tube and can be brought into contact with the support tube. Moreover, at least one latch element is provided that is releasably connectable to the support tube.

20 The vehicle steering head according to the invention is characterized by a number of considerable advantages.

First of all, it is possible to install or utilize the steering head in a frame of any desired design, e.g. children's bicycles or tricycles. Ideally, the dimensions of the steering head are such that they do not interfere with the remaining structure of the frame within which it is installed. Of course, the steering head may be combined with any and all common types of frames where ever its advantageous design is desired. Accordingly, the steering head may be utilized in a variety of devices where limited deflection or rotation and/or locking are desired.

Because the invention utilizes a latch element which is arranged in the support tube, no functional parts of the steering head need be outwardly visible or accessible. Accordingly, the internal parts are less susceptible to damage. Additionally, this design is less likely to cause injury when used by children or infants.

As a result of utilizing a linkage element according to the invention, it is possible to reliably lock the fork tube and thus the wheel fork and the front wheel. Such a locking provision is easily be accomplished by displacing or moving the linkage element. This design ensures a high degree of operational safety and operational reliability.

The linkage element preferably utilizes stop surfaces which cooperate with the latch element in a manner where they are brought into contact with one another. In this way, the steering angle can be limited to a particularly or desired range. This limited range of motion of the steering angle can be realized according to the invention in different ways. The invention contemplates that the available steering angle is freely selectable within a wide desired range. This is of particular advantage to vehicles for children such as tricycles, which may require a steering angle of approximately 45° to each side. Of course, other desirable steering angles cab be utilized. However, by designing in the desired limited steering angle, lateral tilting of the tricycle or similar devices can be prevented or its risk significantly reduced.

Additionally, the risk of injuries which may be caused by the pedals, e.g., devices which utilize pedals on the front wheel can be reduced. Finally, the risk of injury which can occur when the handlebar exceeds a controlled steering angle can be ruled out to a considerable extent.

5 The invention also provides for a linkage element having a locking element which is releasably connectable to the latch element. This design ensures that when a push rod is used for pushing the device, i.e., a tricycle, the front wheel thereof may be reliably locked in place during straight travel.

10 In an advantageous embodiment of the invention, the latch element is designed in the form of a pin which extends in a direction transverse to the fork tube. The pin may extend through the fork tube such that it projects at both sides of the fork tube. Alternatively, the pin can project from the fork tube on only one side. Moreover, the pin can be firmly connected to the fork tube, e.g. by welding or other conventional attachment techniques. Additionally, it may be secured by press fitting with or without utilizing a knurled portion. Of course, the dimensions of the pin can easily be adapted to the respective conditions of use.

15 It should be noted that the manufacturing costs of the steering head are reduced by the above-described construction to quite a considerable degree.

20 In another advantageous embodiment of the invention, the linkage element is substantially designed in the form of a hollow cylinder. Thus, the linkage element can be reliably guided in the support tube and surround the fork tube. Additionally, the linkage element can be designed as a single integral part or several parts which are either joined together or which cooperate together.

25 It is advantageous for the longitudinal displacement or movement of the linkage element to be along an axis of the support tube and the fork tube. Accordingly, the support tube may comprise at least one longitudinal slot or a similar

recess through which a connection element extends which is connected to the linkage element. This design also utilizes a slide which is arranged outside the support tube.

The slide facilitates the ease of handling or movement of the linkage element. In such a design, a displacement of the slide, which may additionally be provided with locking mechanism or fixing safety mechanism, effects a corresponding displacement or movement of the linkage element. The locking mechanism or fixing mechanism allows for fixing the front wheel in a single or set travel position which is preferably straight. Moreover, the invention also contemplates that the linkage element may be provided with inclined inlet surfaces or intercepting mechanisms which engage the latch element so as to initiate a locking action when the front wheel is slightly deflected angularly.

Stop surfaces on the latch element are preferably formed on at least one front attachment of the linkage element. Additionally, it is particularly advantageous when two opposite attachments or stops are in symmetry with each other and are each provided with at least one stop surface located on the linkage element. Thus, by utilizing two attachments or stops which are in symmetry with each other, this design can limit the steering angle in a symmetrical fashion to both the left and the right side.

In another advantageous embodiment of the invention, the associated stop surfaces of the attachments or stops act to limit the rotation of the fork tube to a predetermined angular range at both sides. This angular range may e.g. be approximately 45° to both sides, for a total range of motion of approximately 90° .

The locking element is preferably designed in the form of at least one front recess which receives the latch element. Such an advantageous design makes it possible to grip and fix the latch element upon displacement or movement of the linkage element. Additionally, it is advantageous that the recess is retracted or set back relative to the front attachment, so that the attachments or stops can always

remain in the plane of the latch element, while upon a displacement of the latch element, it is only the recess which can additionally be brought into engagement.

To implement a simple and operationally reliable structure of the steering head, it may be of advantage that the recess be centrally arranged between the two attachments or stops.

The invention also contemplates that the fork tube itself has not been changed constructionally. In other words, the invention can be adapted to work with a conventional fork tube. Also, the invention makes it possible to manufacture all functional parts separately in a very simple manner. As a result, advantageous production costs can be achieved.

In a preferred design of a previously described embodiment, the linkage element is designed as part of a mudguard which extends from below into the support tube. This design allows for significant cost savings since the mudguard is normally made from plastics and is typically already included in most vehicles of the above-described type. The linkage element can thus be mounted on the mudguard or made integrally therewith, in a particularly easy way and at low costs.

A further advantage of the this embodiment is that the latch element can be designed in the form of a bolt which arranged to be parallel with the fork tube. The latch element of this design can thus be given relatively large dimensions so that the diameter of the support tube itself need not be chosen with such a large size.

It may be of particular advantage when the latch element is connected to a slide which extends into the support tube so as to be able to design the lock of the front wheel in a particularly simple manner. Furthermore, the locking element may preferably be connected to the slide. Moreover, the locking element serves to reliably maintain the locked state and to prevent any unintended unlocking. The locking element also preferably engages into a recess of a bearing which supports the fork

tube in the support tube. As a result, it is not necessary to mount additional parts or to take installation measures on the support tube itself.

It may also be of particular advantage for the limitation of the steering angle to be accomplished by a lower bearing which supports the fork tube in the support tube. This lower bearing may have formed thereon an attachment which projects in the direction of the linkage element and which can be brought into contact with the stop surfaces formed on the linkage element and thus on the mudguard. This design has the advantageous effect that the predetermined angular range can be limited at both sides as well, e.g. approximately 45° each side.

The invention provides of a vehicle steering head including a support tube which rotatably supports therein a fork tube to which a wheel fork and a handlebar can be secured, the steering head including a latch element projecting from the fork tube and disposed within the support tube, and a linkage element disposed within the support tube, wherein the linkage element is moveable in a direction which is substantially parallel to an axis of the fork tube and comprises at least one stop surface for limiting a rotation of the fork tube when the latch element contacts the at least one stop surface. The linkage element may further comprise at least one locking element for locking the fork tube in a single position. The at least one locking element may releasably engage the latch element when the fork tube is locked. The latch element may comprises a pin. The pin may project substantially perpendicular to the axis of the fork tube. The linkage element may comprise a substantially cylindrical shape. The linkage element may comprise a plurality of hollow chambers separated by connecting walls. The support tube may comprise an opening which allows a connecting element to pass therethrough. The opening may comprise a longitudinal slot. The connecting element may be secured to the linkage element. The movement of the linkage element may be limited by the movement of the

connecting element within the longitudinal slot. The steering head may further comprise a slide which is secured the connecting element, the slide being disposed adjacent an outer surface of the support tube. The at least one stop surface may be disposed on at least one stop.

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The at least one stop may comprise a projection which extends from the linkage element. The at least one stop may comprise wedge-shaped hollow projection having two angled lateral stop surfaces. The at least one stop may comprise two stops which are disposed opposite one another. Each stop may comprise wedge-shaped hollow projection having two angled lateral stop surfaces. The two stops may define a limited range of rotational motion of the fork tube in each of a clockwise and a counter-clockwise direction. The limited range of motion in the clockwise direction may be substantially equal to the range of motion in the counter-clockwise direction. The limited range of motion in one of the clockwise and counter-clockwise direction may be approximately 45 degrees.

The linkage element may further comprise at least one locking element, the at least one locking element comprising at least one recess which is adapted to receive the latch element. The at least one recess is set back some distance from a surface of at least one stop. The at least one recess is centrally disposed between at least two stops.

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The steering head may further comprise an upper bearing disposed on one end of the support tube and a lower bearing disposed on another end of the support tube, each of the upper and lower bearings having an opening which allows the fork tube to pass therethrough.

The steering head may be disposed on a tricycle frame.

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5 The invention also provides for a vehicle steering head including a support tube which rotatably supports therein a fork tube to which a wheel fork and a handlebar can be secured, the steering head including a latch element disposed within the support tube, the latch element being moveable in a direction which is substantially parallel to an axis of the fork tube, and a linkage element connected to the fork tube so as to rotate therewith, the linkage element comprising at least one stop surface, wherein the at least one stop surface limits the rotation of the fork tube with respect to the support tube. The steering head may further comprise a slide, wherein the slide is disposed within the support tube and retains the latch element. The slide may further comprise at least one locking element for releasably securing the slide to the support tube. The linkage element may comprise a mudguard. The mudguard may be disposed between one end of the support tube and a wheel fork. The latch element may comprise a rod like member which is arranged substantially parallel to the axis of the fork tube. The rod like member may comprise one of a bolt and a pin. The latch element may be connected to a slide, the slide being disposed within the support tube. The slide may be moveable substantially parallel to the axis of the fork tube. A locking element may be connected to the slide.

20 The steering head may further comprise a bearing support disposed on at least one end of the support tube. The bearing support may be disposed on a lower end of the support tube. The steering head may further comprise a locking element disposed within the support tube, the locking element being insertable into a recess of the bearing support. The bearing support may comprise at least one stop, the at least one stop comprising at least one surface which engages the linkage element. The at least one stop may comprise a projection which engages a recess in the linkage element. 25 The projection and the recess may cooperate to limit the rotational movement of the fork tube within a desired range. The range of the rotational movement may be



limited by at least two stop surfaces. The at least two stop surfaces may define a limited range of rotation in one of a clockwise and a counter-clockwise direction. The at least two stop surfaces may define a limited range of rotation in each of a clockwise and a counter-clockwise direction. The limited range of rotation between the at least two stops may be approximately 45 degrees.

The steering head may be disposed on a tricycle frame.

The invention further provides for a vehicle steering head including a support tube and fork tube which is rotatably mounted with respect to the support tube, the steering head including an upper bearing support disposed at an upper end of the support tube, a lower bearing support disposed at a lower end of the support tube, the fork tube comprising a fork end, a handlebar, and a latch element projecting from the fork tube between the fork end and the handlebar end, the latch element being disposed within the support tube, a linkage element slidable disposed within the support tube, the linkage element comprising at least one stop surface for engaging the latch element, wherein the linkage element is moveable in a direction which is substantially parallel to an axis of the fork tube from a first position where the latch element and the at least one stop cooperate to limit the rotational movement of the fork tube to a second position where the latch element releasably engages a locking element disposed on the linkage element whereby the fork tube is prevented from rotating in any direction. The linkage element may be moveable from outside the support tube via a slide. The slide may be connected to the linkage element via a connection element, the connection element passing through a longitudinal in the support tube. The longitudinal slot may limit the movement of the linkage element.

The invention also relates to a vehicle steering head including a support tube and fork tube which is rotatably mounted with respect to the support tube, the steering head including an upper bearing support disposed at an upper end of the support tube,



5 a lower bearing support disposed at a lower end of the support tube, the lower bearing support comprising at least one stop surface, the fork tube comprising a fork end, a handlebar, and a latch element which is slidably disposed adjacent the fork tube between the fork end and the handlebar end, the latch element being disposed within the support tube, a linkage element moveably disposed adjacent the lower support bearing, the linkage element comprising at least one stop surface for engaging the at least one stop surface of the lower bearing support and comprising a recess for receiving the latch element, wherein the linkage element is moveable in a direction which is substantially parallel to an axis of the fork tube from a first position where the latch element engages only the lower bearing support and where the at least one stop of the lower bearing support cooperates with the at least one stop of the linkage element to limit the rotational movement of the fork tube to a second position where the latch element releasably engages a recess in the linkage element whereby the fork tube is prevented from rotating in any direction. The linkage element may be moveable from outside the support tube via a slide. The slide may be connected to the linkage element via a connection element, the connection element passing through a longitudinal in the support tube. The longitudinal slot may limit the movement of the linkage element. The linkage element may further comprise at least one locking element for engaging a locking recess in the lower bearing support. The at least one locking element engages the locking recess of the lower bearing support when the latch element engages the recess in the linkage element.

20 The invention provides for a vehicle steering head including a fork tube adapted to engage a handlebar, a support tube which rotatably supports the fork tube, a latch element disposed within the support tube, and a slide which is moveable with respect to the support tube, wherein the slide is moveable from at least one position wherein linkage element prevents the fork tube from rotating with respect to the

support tube to at least another position wherein the linkage element allows the fork tube to rotate with respect to the support tube in at least two directions. The latch element may comprise a rod-like member.

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BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is further described in the detailed description which follows, in reference to the noted plurality of drawings by way of non-limiting examples of exemplary embodiments of the present invention, in which like reference numerals represent similar parts throughout the several views of the drawings, and wherein:

Fig. 1 is a schematic side view of a children's tricycle with one embodiment of the vehicle steering head according to the invention;

Fig. 2 is a simplified sectional side view of the steering head according to the invention in an unlocked state;

Fig. 3 is a side view, turned or oriented by 90° (a right angle) of the arrangement shown in Fig. 2;

Fig. 4 is a sectional side view similar to Fig. 2, in the locked state;

Fig. 5 is a side view, similar to Fig. 3, of the view according to Fig. 4;

Fig. 6 is a simplified perspective illustration of the linkage element according to the invention;

Fig. 7 is a schematic side view of a children's tricycle with another embodiment of the vehicle steering head according to the invention;

Fig. 8 is a sectional side view of the vehicle steering head according to the invention, in the unlocked state;

Fig. 9 is a side view, turned or oriented by 90° of the arrangement shown in Fig. 8;

Fig. 10 is a sectional side view similar to Fig. 8, in the locked state;

Fig. 11 is a side view, turned or oriented by 90° which is similar to Fig. 9, in the locked state;

Fig. 12 is a top view on the linkage element according to the invention and on the associated mudguard;

Fig. 13 is a sectional view of the arrangement according to Fig. 12 along the sectional lines XIII-XIII of Fig. 12;

Fig. 14 is an enlarged side view showing a portion of the slide and of the locking element in the locked state;

Fig. 15 is a view analogous to Fig. 14, in the unlocked state;

Fig. 16 is a top view on the slide; and

Fig. 17 is a top view on the lower bearing.

DETAILED DESCRIPTION OF THE INVENTION

The particulars shown herein are by way of example and for purposes of illustrative discussion of the embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the present invention. In this regard, no attempt is made to show structural details of the present invention in more detail than is necessary for the fundamental understanding of the present invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the present invention may be embodied in practice.

A children's tricycle is shown in Fig. 1 and comprises a front wheel 14 which is supported on a wheel fork 4. Wheel fork 4 is fixedly connected to a fork tube 3. A handlebar (not shown) can be secured to the upper end of fork tube 3.

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On its front upper portion, linkage element 6 comprises two symmetrical opposite attachments or stops 12. Each of these stops 12 may be provided with lateral stop surfaces 7. When viewed from the top, these attachments or stops 12 are designed in a manner of a segment of a partial circle (pie shaped or wedge shaped), so that four stop surfaces 7 are formed with each one being arranged in symmetry

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a1 with one another. Of course, stops 12 may be separately formed and attached to linkage element 6 instead of being integrally formed therewith as is shown.

In the illustrated embodiment two locking elements 8 may be utilized in which each is formed by a recess 13. These locking elements 8 are preferably provided on linkage element 6 in retracted or set back manner with respect to stops 12. As becomes apparent from Fig. 6, the walls of at least one recess 13 may be made resilient to ensure a releasable locking of a bolt-like latch element 5 when linkage element 6 is pushed upwards or into engagement with bolt-like latch element 5.

As becomes apparent from Figs. 2 to 5, fork tube 3 is provided with a bolt-like or pin-like latch element 5 which extends or projects from at least one and preferably both sides of fork tube 3. Of course, latch element 5 may be integrally formed with fork tube. Alternatively, latch element 5 may be a threaded or partially threaded member which threads into fork tube 3. However, it is preferred that latch element 5 is a pin having a centrally disposed exterior knurl which is press fit into fork tube as is shown. In its working position, latch element 5 rotates with fork tube 3 when a deflection or rotation of the handlebar takes place. The deflection of the handlebar is limited by way of latch element 5 abutting on stop surfaces 7, these stop surfaces 7 defining the limited range of motion of the handlebar.

When it is desired to lock the handlebar in a set position, latch element 5 is pressed or forced into recesses 13. This engagement occurs when locking element 8, which is disposed on linkage element 6, is pushed upwards by slide 11. Recesses 8 also utilize inclined inlet surfaces because they act as guiding lead-in surfaces which facilitate entry of pin 5 into recess 8. In the locked state, which is shown in Figs. 4 and 5, a steering movement thus becomes impossible since the handlebar or fork tube 3 is locked in a single direction. Figs 2 and 3 show a downwardly displaced condition of linkage element 6 in which latch element 5 is in a position which it does not

a² cooperate with the locking element 8. As a result, in this position fork tube 3 and handlebar are free to rotate until latch element 5 abuts on stop surfaces 7, this range of movement or rotation corresponding to a steering angle range.

According to a preferred aspect of the invention, linkage element 6 may be made from a plastic material. Of course, other materials are also contemplated.

Another embodiment of the vehicle steering head according to the invention is described with reference to Figs. 7 to 16. In this regard, like parts are provided with like reference numerals.

As for the description of Fig. 7, reference can be made to the description of Fig. 1 to the extent that the same features are shown. The subsequent figures are illustrations elucidating the details which have been changed.

As in Figs. 2 to 5, Figs. 8 and 9 and 10 and 11, respectively, are illustrations showing the vehicle steering head on an enlarged scale. Again, like parts are here also provided with like reference numerals, so that reference can be made to the preceding explanations. Slide 11 utilizes connection element 10 and screw 20. Connection element 10 also extends through a longitudinal slot 9. Moreover, slide 11 comprises an outer grip portion 11 and an interior portion 11' which is screwed to outer grip portion 11 by a screw 20. A top view of slide 11 and 11' is shown in Fig. 16. As can be seen in this figure, a central recess 24 is provided through which fork tube 3 extends or passes (with a clearance which allows slide 11' to move up and down with respect to fork tube 3). Furthermore, slide 11' also has a recess (see figs. 9, 11 and 16) which is formed so that it can accept a bolt-like latch element 5'. Of course, this latch element 5' may be pressed into this recess, threaded into the recess, or otherwise secured to slide 11' in a suitable manner. Alternatively, latch element 5' may be integrally formed with slide 11'.

As already described in conjunction with a previous embodiment, a bearing 15 which serves as a slide bearing is used on the upper portion of steering head 1.

Lower bearing 15' in this embodiment is configured such that it has an upwardly projecting contour of a linkage element 6' which can extend into bearing 15'. Of course, the bearing and the upwardly projecting contour may be made as separate components which are joined together by conventional techniques rather than integrally formed as is shown. Additionally, as becomes apparent in Fig. 12, linkage element 6' may have a recess 25 into which latch element 5' can be inserted (see also Figs. 9 and 11).

As can further be seen from the top view of Fig. 12, linkage element 6' comprises two lateral stop surfaces 7 which are angularly spaced apart from each other. This design is such that a downwardly oriented attachment or stop 26 (see Figs. 8 to 11) of the bearing 15', which is connected to support tube 2 for rotation therewith, forms a steering limitation of plus/minus approximately 45°. Of course, as with the previous embodiment, the range of steering limitation can be designed to any desired range.

Fig. 13 shows a lateral sectional view of mudguard 22 and of linkage element 6'. Note that these components are integrally formed as a single member which reduces manufacturing costs associated with joining two separate components.

Figs. 14 and 15 are front views of slide 11' wherein handpiece 11 has been removed to illustrate the operation of locking element 8'. Locking element 8' comprises a U-shaped and includes two movable or flexible lateral legs which can releasably be inserted into a recess 23 of bearing 15'. Upon insertion and locking, locking element 8' is pressed against an undercut and thereby held in position inside recess 23. Accordingly, when it is desired to release the locked state of fork tube 3, slide 11' must be pushed upwards which removes the legs from recess 23. Of course,

other locking mechanisms may be utilized and this embodiment is not limited to the use of this particular locking mechanism. For example, a pin may be used which has a floating ring disposed around its circumference. Alternatively, other conventional releasable locking mechanisms may be utilized.

5 Fig. 17 is a top view on lower bearing 15' on an enlarged scale. The (downwardly projecting) attachment or stop 26 can here be seen as well as recess 23 which receives locking element 8'. Moreover, recess 27 is adapted to receive and guide bolt-like latch element 5' therein. Furthermore, a surrounding collar-like edge 28 can be seen in which 29 designates two oppositely disposed attachments or projections which serve as anti-rotation engagements. These engagements are designed to engage recesses (not shown) of support tube 2. Of course, lower bearing may be secured to support tube 2 in any conventional manner such as by bonding, welding, or screws. Moreover, this attachment may be releasable or more permanent in nature.

10 It is noted that the foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention. While the present invention has been described with reference to an exemplary embodiment, it is understood that the words which have been used herein are words of description and illustration, rather than words of limitation. Changes may be made, within the purview of the appended claims, as presently stated and as amended, without departing from the scope and spirit of the present invention in its aspects. Although the present invention has been described herein with reference to particular means, materials and embodiments, the present invention is not intended to be limited to the particulars disclosed herein; rather, the present invention extends to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims.

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